FIG. 1

DIFFERENTIAL SIGNAL OUTPUT CIRCUIT IN FIRST EMBODIMENT
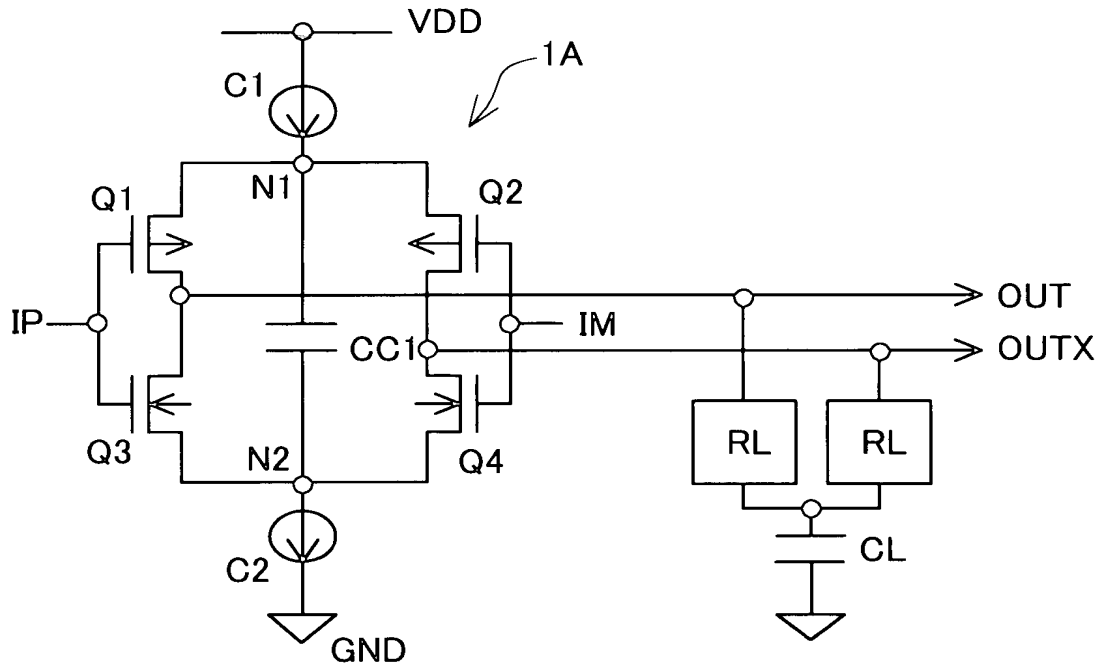

FIG. 2

EXAMPLE OF CURRENT SOURCE IN FIRST EMBODIMENT
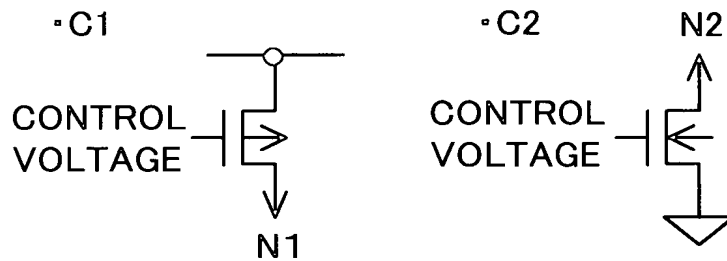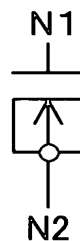

FIG. 3

SPECIFIC EXAMPLE OF CAPACITOR IN FIRST EMBODIMENT
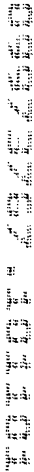
FIG. 4

SPECIFIC EXAMPLE IN FIRST EMBODIMENT

FIG. 5A

DIFFERENTIAL OUTPUT WAVEFORMS ACCORDING TO RESULT
OF SIMULATION OF SPECIFIC EXAMPLE OF FIRST EMBODIMENT

PRIOR ART

Params(lin)

Time(lin)(TIME)

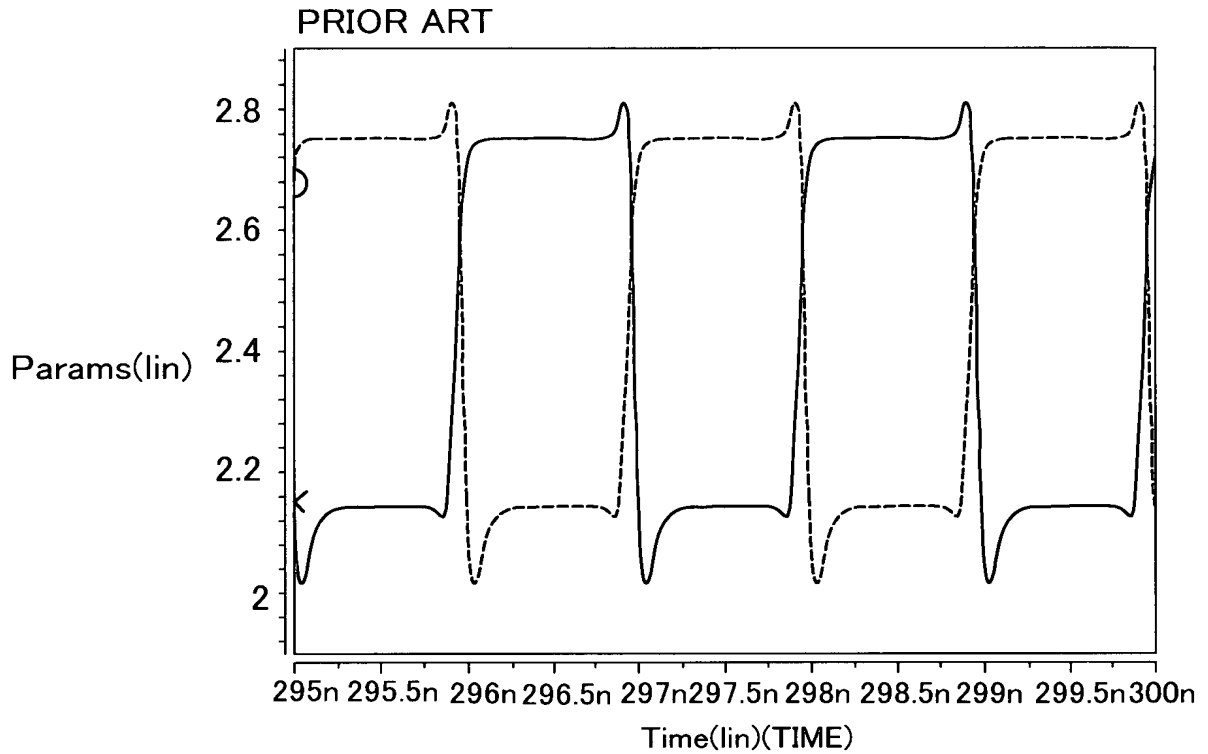# FIG. 5B

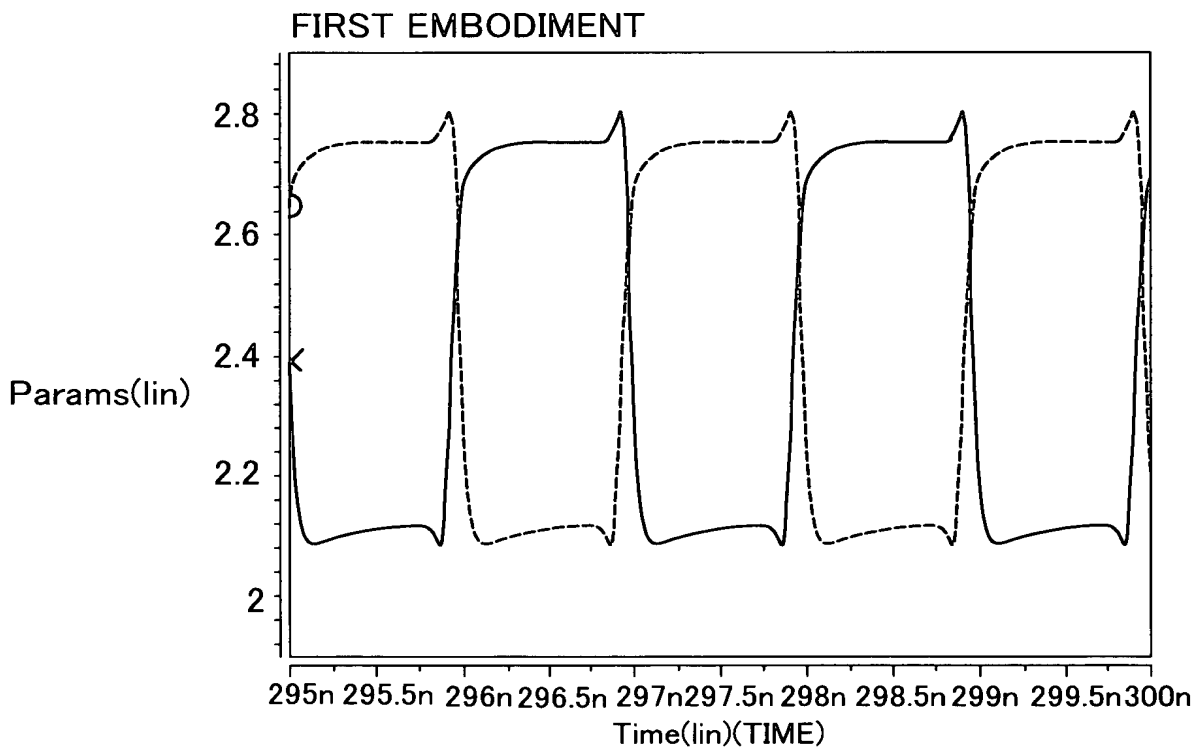FIRST EMBODIMENT

Params(lin)

Time(lin)(TIME)

FIG. 6

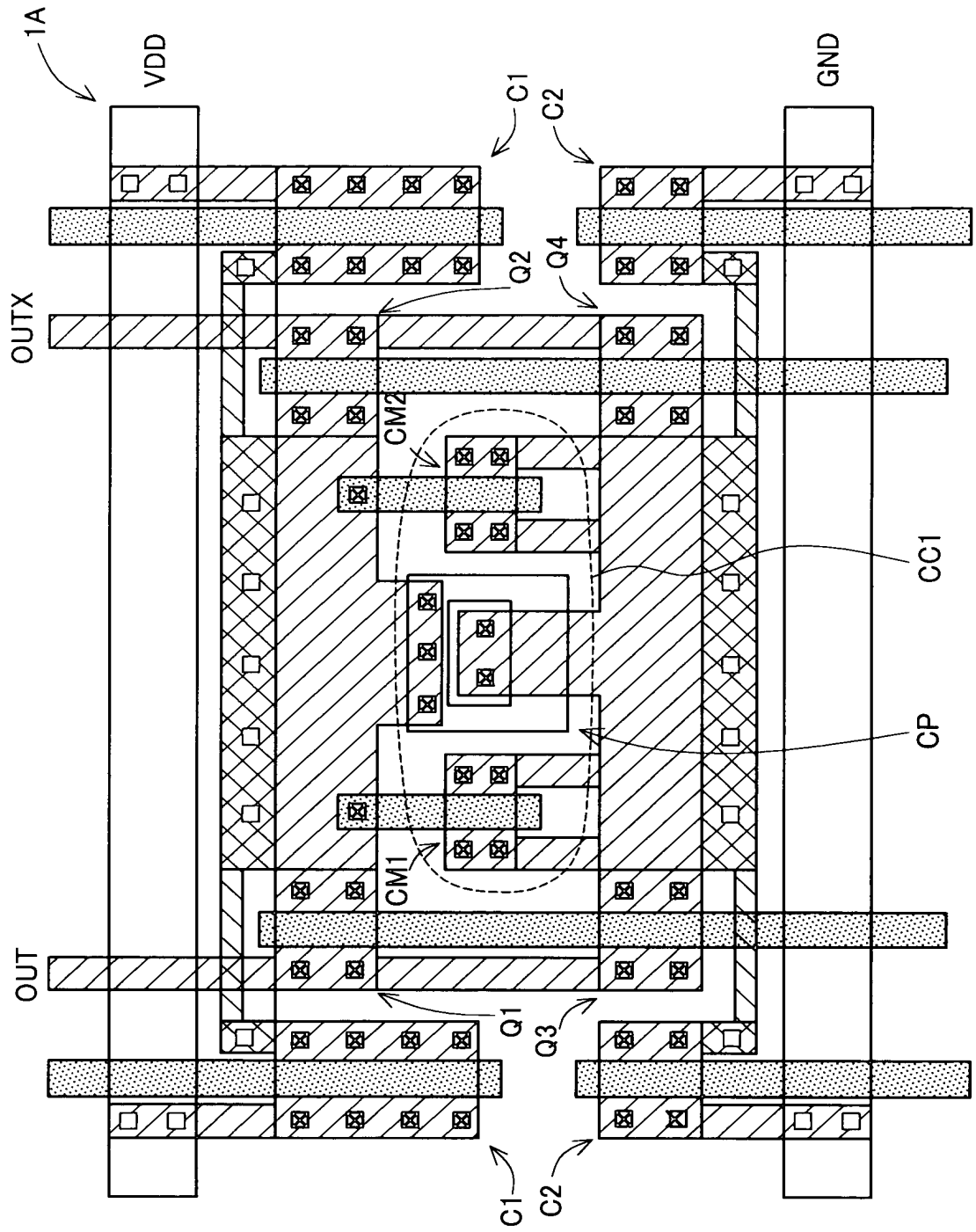LAYOUT OF DIFFERENTIAL SIGNAL OUTPUT CIRCUIT IN FIRST EMBODIMENT

FIG. 7A

DIFFERENTIAL SIGNAL OUTPUT CIRCUIT IN SECOND EMBODIMENT
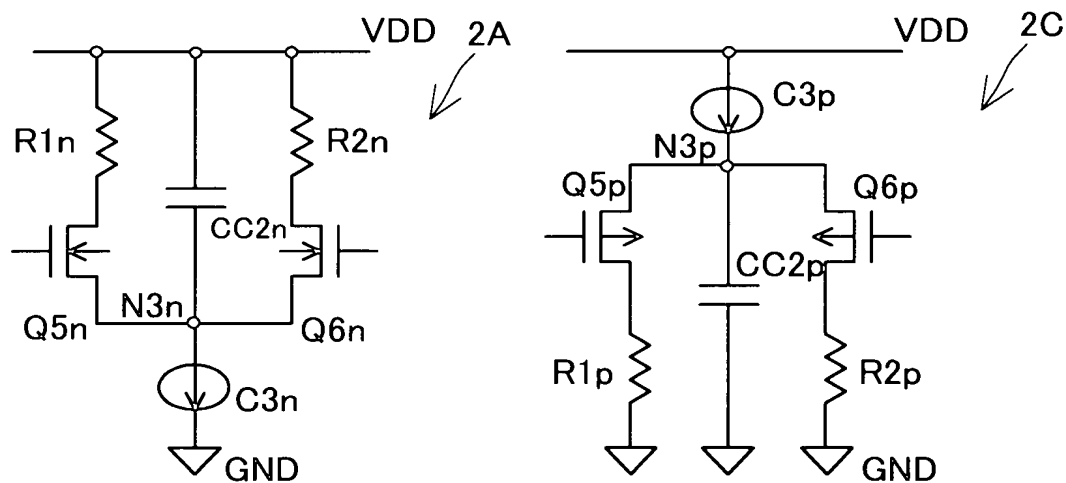
CIRCUIT STRUCTURED WITH PASSIVE LOADS

FIG. 7B

CIRCUIT STRUCTURED WITH ACTIVE LOADS
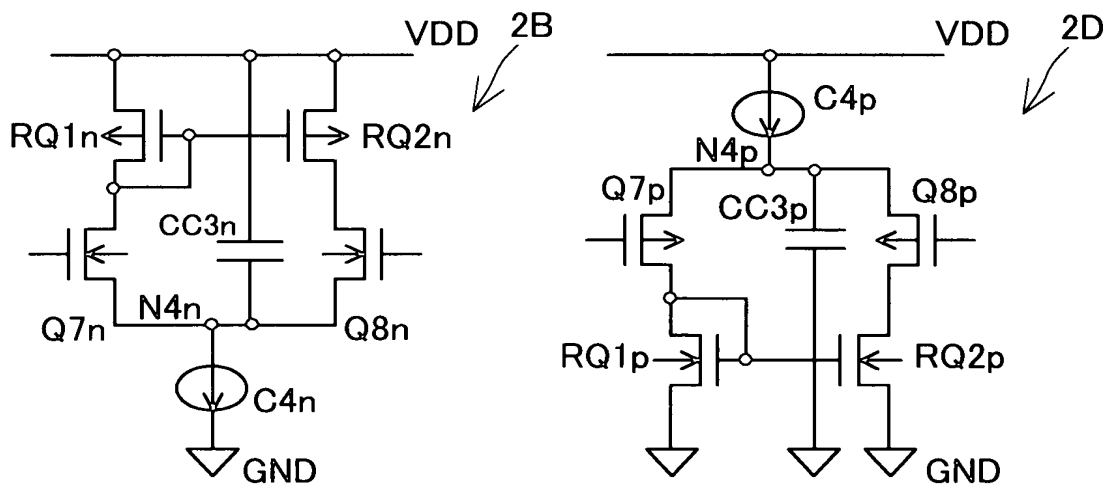
FIG. 8

BLOCK DIAGRAM ILLUSTRATING SIGNAL DETECTION APPARATUS IN THIRD EMBODIMENT
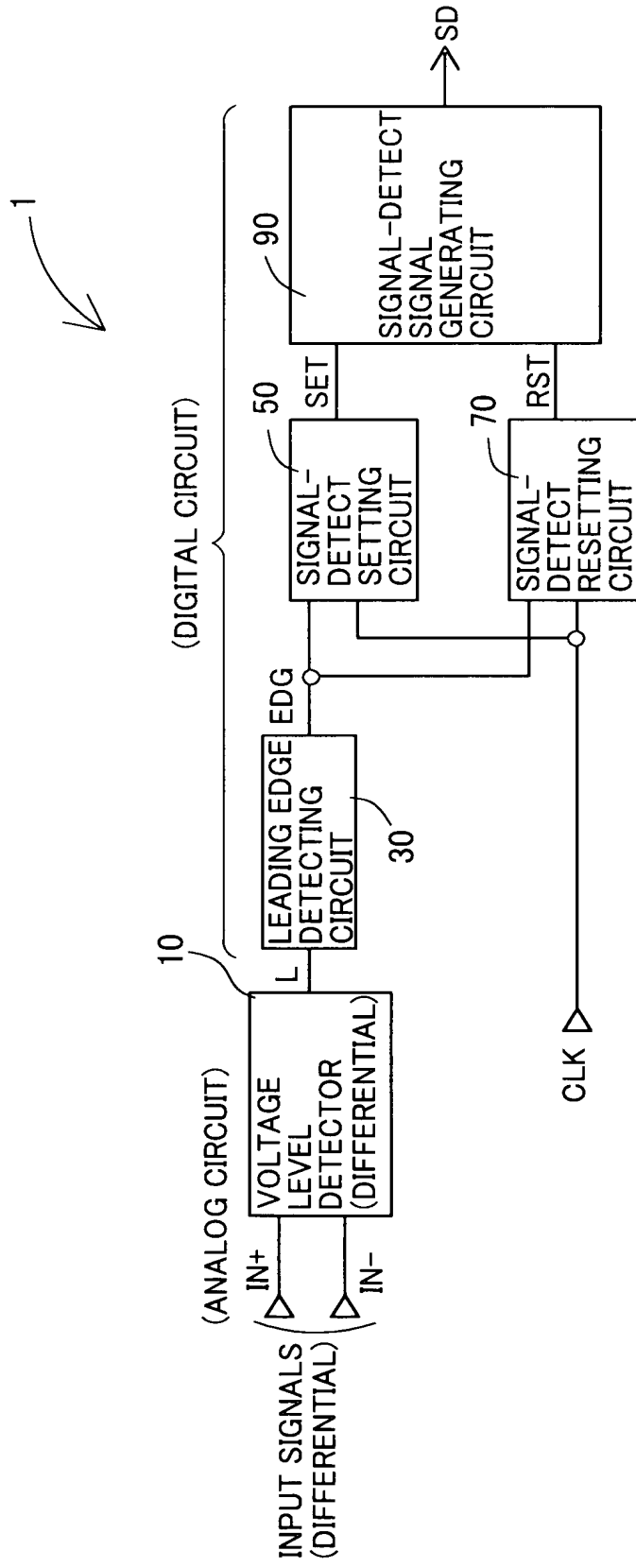
FIG. 9

TIMING PARAMETERS OF SIGNAL-DETECT SIGNALS ACCORDING TO P1394b STANDARD

DETECTION OF
VALID SIGNAL

DETECTION OF
INVALID SIGNAL

SD
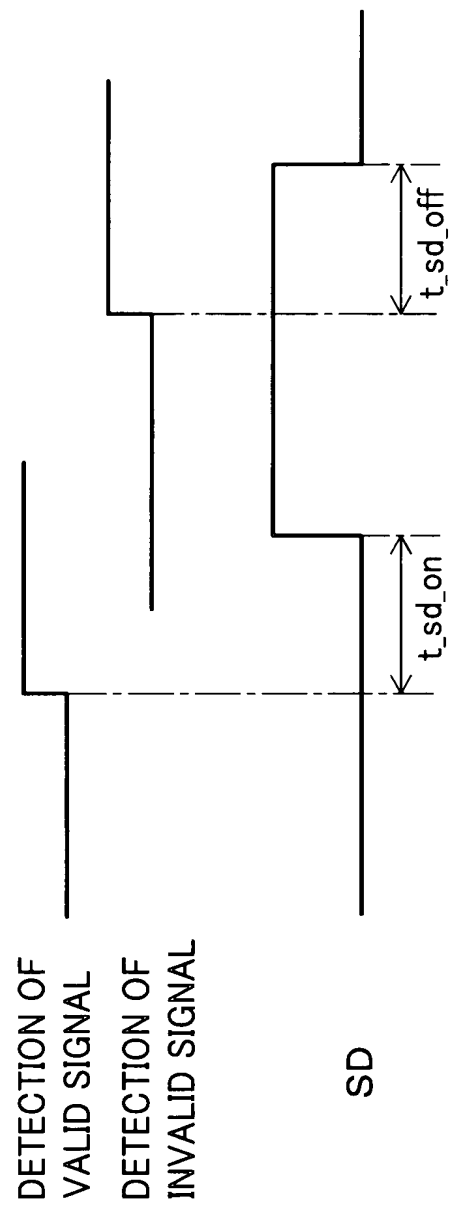
t_sd_on t_sd_off

SYMBOL	PARAMETER	UNIT	MIN.	MAX.
t_sd_on	DELAY TIME FROM DETECTION OF A VALID SIGNAL UNTIL ASSERTION OF A SIGNAL-DETECT SIGNAL	μ sec	–	100
t_sd_off	DELAY TIME FROM DETECTION OF AN INVALID SIGNAL UNTIL NAGATION OF A SIGNAL-DETECT SIGNAL	μ sec	–	t_sd_on

FIG. 10

CODE TABLE(1)
8b10bCODES ACCORDING TO P1394b STANDARD

	INPUT	ABCDEI FGHJ OUTPUT			INPUT	ABCDEI FGHJ OUTPUT	
NAME	A'B'C'D'E'F'G'H'	RD<0	RD>0	NAME	A'B'C'D'E'F'G'H'	RD<0	RD>0
	I	DATA_TABLE[I][0]	DATA_TABLE[I][1]		I	DATA_TABLE[I][0]	DATA_TABLE[I][1]
D0.0	00000000	1001110100	0110001011	D4.0	00100000	1101010100	0010101011
D0.4	00000001	1001110010	0110001101	D4.4	00100001	1101010010	0010101101
D0.2	00000010	1001110101	0110000101	D4.2	00100010	1101010101	0010100101
D0.6	00000011	1001110110	0110000110	D4.6	00100011	1101010110	0010100110
D0.1	00000100	1001111001	0110001001	D4.1	00100100	1101011001	0010101001
D0.5	00000101	1001111010	0110001010	D4.5	00100101	1101011010	0010101010
D0.3	00000110	1001110011	0110001100	D4.3	00100110	1101010011	0010101100
D0.7	00000111	1001110001	0110001110	D4.7	00100111	1101010001	0010101110
D16.0	00001000	0110110100	1001001011	D20.0	00101000	0010011011	0010110100
D16.4	00001001	0110110010	1001001101	D20.4	00101001	0010111101	0010110010
D16.2	00001010	0110110101	1001000101	D20.2	00101010	0010110101	0010110101
D16.6	00001011	0110110110	1001000110	D20.6	00101011	0010110110	0010110110
D16.1	00001100	0110111001	1001001001	D20.1	00101100	0010111001	0010111001
D16.5	00001101	0110111010	1001001010	D20.5	00101101	0010111010	0010111010
D16.3	00001110	0110110011	1001001100	D20.3	00101110	0010111100	0010110011
D16.7	00001111	0110110001	1001001110	D20.7	00101111	0010110111	0010110001
D8.0	00010000	1110010100	0001101011	D12.0	00110000	0011011011	0011010100
D8.4	00010001	1110010010	0001101101	D12.4	00110001	0011011101	0011010010
D8.2	00010010	1110010101	0001100101	D12.2	00110010	0011010101	0011010101
D8.6	00010011	1110010110	0001100110	D12.6	00110011	0011010110	0011010110
D8.1	00010100	1110011001	0001101001	D12.1	00110100	0011011001	0011011001
D8.5	00010101	1110011010	0001101010	D12.5	00110101	0011011010	0011011010
D8.3	00010110	1110010011	0001101100	D12.3	00110110	0011011100	0011010011
D8.7	00010111	1110010001	0001101110	D12.7	00110111	0011010111	0011010001
D24.0	00011000	1100110100	0011001011	D28.0	00111000	0011101011	0011100100
D24.4	00011001	1100110010	0011001101	D28.4	00111001	0011101101	0011100010
D24.2	00011010	1100110101	0011000101	D28.2	00111010	0011100101	0011100101
D24.6	00011011	1100110110	0011000110	D28.6	00111011	0011100110	0011100110
D24.1	00011100	1100111001	0011001001	D28.1	00111100	0011101001	0011101001
D24.5	00011101	1100111010	0011001010	D28.5	00111101	0011101010	0011101010
D24.3	00011110	1100110011	0011001100	D28.3	00111110	0011101100	0011100011
D24.7	00011111	1100110001	0011001110	D28.7	00111111	0011100111	0011100001
D2.0	01000000	1011010100	0100101011	D6.0	01100000	0110011011	0110010100
D2.4	01000001	1011010010	0100101101	D6.4	01100001	0110011101	0110010010
D2.2	01000010	1011010101	0100100101	D6.2	01100010	0110010101	0110010101
D2.6	01000011	1011010110	0100100110	D6.6	01100011	0110010110	0110010110
D2.1	01000100	1011011001	0100101001	D6.1	01100100	0110011001	0110011001
D2.5	01000101	1011011010	0100101010	D6.5	01100101	0110011010	0110011010
D2.3	01000110	1011010011	0100101100	D6.3	01100110	0110011100	0110010011
D2.7	01000111	1011010001	0100101110	D6.7	01100111	0110011110	0110010001
D18.0	01001000	0100111011	0100110100	D22.0	01101000	0110101011	0110100100
D18.4	01001001	0100111101	0100110010	D22.4	01101001	0110101101	0110100010
D18.2	01001010	0100110101	0100110101	D22.2	01101010	0110100101	0110100101
D18.6	01001011	0100110110	0100110110	D22.6	01101011	0110100110	0110100110
D18.1	01001100	0100111001	0100111001	D22.1	01101100	0110101001	0110101001
D18.5	01001101	0100111010	0100111010	D22.5	01101101	0110101010	0110101010
D18.3	01001110	0100111100	0100110011	D22.3	01101110	0110101100	0110100011
D18.7	01001111	0100110111	0100110001	D22.7	01101111	0110101110	0110100001
D10.0	01010000	0101011011	0101010100	D14.0	01110000	0111001011	0111000100
D10.4	01010001	0101011101	0101010010	D14.4	01110001	0111001101	0111000010
D10.2	01010010	0101010101	0101010101	D14.2	01110010	0111000101	0111000101
D10.6	01010011	0101010110	0101010110	D14.6	01110011	0111000110	0111000110
D10.1	01010100	0101011001	0101011001	D14.1	01110100	0111001001	0111001001
D10.5	01010101	0101011010	0101011010	D14.5	01110101	0111001010	0111001010
D10.3	01010110	0101011100	0101010011	D14.3	01110110	0111001100	0111000011
D10.7	01010111	0101011110	0101010001	D14.7	01110111	0111001110	0111001000
D26.0	01011000	0101101011	0101100100	D30.0	01111000	0111100100	1000011011
D26.4	01011001	0101101101	0101100010	D30.4	01111001	0111100010	1000011101
D26.2	01011010	0101100101	0101100101	D30.2	01111010	0111100101	1000010101
D26.6	01011011	0101100110	0101100110	D30.6	01111011	0111100110	1000010110
D26.1	01011100	0101101001	0101101001	D30.1	01111100	0111101001	1000011001
D26.5	01011101	0101101010	0101101010	D30.5	01111101	0111101010	1000011010
D26.3	01011110	0101101100	0101100011	D30.3	01111110	0111100011	1000011100
D26.7	01011111	0101101110	0101100001	D30.7	01111111	0111100001	1000011110
D1.0	10000000	0111010100	1000101011	D5.0	10100000	1010011011	1010010100
D1.4	10000001	0111010010	1000101101	D5.4	10100001	1010011101	1010010010
D1.2	10000010	0111010101	1000100101	D5.2	10100010	1010010101	1010010101
D1.6	10000011	0111010110	1000100110	D5.6	10100011	1010010110	1010010110

FIG. 11 CODE TABLE(2)
8b10bCODES ACCORDING TO P1394b STANDARD

NAME	A'B'C'D'E'F'G'H' (I)	RD<0 DATA_TABLE[I][0]	RD>0 DATA_TABLE[I][1]	NAME	A'B'C'D'E'F'G'H' (I)	RD<0 DATA_TABLE[I][0]	RD>0 DATA_TABLE[I][1]
D1.1	10000100	0111011001	*1000101001*	D5.1	10100100	1010011001	1010011001
D1.5	10000101	0111011010	*1000101010*	D5.5	10100101	1010011010	1010011010
D1.3	10000110	0111011011	1000101100	D5.3	10100110	1010011100	1010010011
D1.7	10000111	0111010001	1000101110	D5.7	10100111	1010010111	*1010010001*
D17.0	10001000	1000111011	1000110100	D21.0	10101000	1010101011	*1010100100*
D17.4	10001001	1000111101	1000110010	D21.4	10101001	1010101101	*1010100010*
D17.2	10001010	1000110101	1000110101	D21.2	10101010	1010100101	1010100101
D17.6	10001011	1000110110	1000110110	D21.6	10101011	1010100110	1010100110
D17.1	10001100	1000111001	1000111001	D21.1	10101100	1010101001	1010101001
D17.5	10001101	1000111010	1000111010	D21.5	10101101	1010101010	1010101010
D17.3	10001110	1000111100	1000110011	D21.3	10101110	1010101100	1010100011
D17.7	10001111	1000110111	1000110001	D21.7	10101111	1010101110	*1010100001*
D9.0	10010000	1001011011	*1001010100*	D13.0	10110000	1011001011	1011000100
D9.4	10010001	1001011101	*1001010010*	D13.4	10110001	1011001101	1011000010
D9.2	10010010	1001010101	1001010101	D13.2	10110010	1011000101	1011000101
D9.6	10010011	1001010110	1001010110	D13.6	10110011	1011000110	1011000110
D9.1	10010100	1001011001	1001011001	D13.1	10110100	1011001001	1011001001
D9.5	10010101	1001011010	1001011010	D13.5	10110101	1011001010	1011001010
D9.3	10010110	1001011100	1001010011	D13.3	10110110	1011001100	1011000011
D9.7	10010111	1001011110	*1001010001*	D13.7	10110111	1011001110	1011001000
D25.0	10011000	1001101011	1001100100	D29.0	10111000	1011100100	0100011011
D25.4	10011001	1001101101	1001100010	D29.4	10111001	1011100010	0100011101
D25.2	10011010	1001100101	1001100101	D29.2	10111010	1011100101	*0100010101*
D25.6	10011011	1001100110	1001100110	D29.6	10111011	1011100110	0100010110
D25.1	10011100	1001101001	1001101001	D29.1	10111100	1011101001	0100011001
D25.5	10011101	1001101010	1001101010	D29.5	10111101	1011101010	0100011010
D25.3	10011110	1001101100	1001100011	D29.3	10111110	1011100011	0100011100
D25.7	10011111	1001101110	1001100001	D29.7	10111111	1011100001	0100011110
D3.0	11000000	1100011011	1100010100	D7.0	11100000	1110001011	0001110100
D3.4	11000001	1100011101	1100010010	D7.4	11100001	1110001101	0001110010
D3.2	11000010	1100010101	1100010101	D7.2	11100010	1110000101	0001110101
D3.6	11000011	1100010110	1100010110	D7.6	11100011	1110000110	0001110110
D3.1	11000100	1100011001	1100011001	D7.1	11100100	1110001001	0001111001
D3.5	11000101	1100011010	1100011010	D7.5	11100101	1110001010	0001111010
D3.3	11000110	1100011100	1100010011	D7.3	11100110	1110001100	0001110011
D3.7	11000111	1100011110	1100010001	D7.7	11100111	1110001110	0001110001
D19.0	11001000	1100101011	1100100100	D23.0	11101000	1110100100	0001011011
D19.4	11001001	1100101101	1100100010	D23.4	11101001	1110100010	0001011101
D19.2	11001010	1100100101	1100100101	D23.2	11101010	1110100101	*0001010101*
D19.6	11001011	1100100110	1100100110	D23.6	11101011	1110100110	0001010110
D19.1	11001100	1100101001	1100101001	D23.1	11101100	1110101001	0001011001
D19.5	11001101	1100101010	1100101010	D23.5	11101101	1110101010	0001011010
D19.3	11001110	1100101100	1100100011	D23.3	11101110	1110100011	0001011100
D19.7	11001111	1100101110	1100100001	D23.7	11101111	1110100001	0001011110
D11.0	11010000	1101001011	1101000100	D15.0	11110000	0101110100	1010001011
D11.4	11010001	1101001101	1101000010	D15.4	11110001	0101110010	1010001101
D11.2	11010010	1101000101	1101000101	D15.2	11110010	0101110101	*1010000101*
D11.6	11010011	1101000110	1101000110	D15.6	11110011	0101110110	1010000110
D11.1	11010100	1101001001	1101001001	D15.1	11110100	0101111001	*1010001001*
D11.5	11010101	1101001010	1101001010	D15.5	11110101	0101111010	*1010001010*
D11.3	11010110	1101001100	1101000011	D15.3	11110110	0101110011	1010001100
D11.7	11010111	1101001110	1101001000	D15.7	11110111	0101110001	1010001110
D27.0	11011000	1101100100	0010011011	D31.0	11111000	1010110100	0101001011
D27.4	11011001	1101100010	0010011101	D31.4	11111001	1010110010	0101001101
D27.2	11011010	1101100101	*0010010101*	D31.2	11111010	1010110101	*0101000101*
D27.6	11011011	1101100110	0010010110	D31.6	11111011	1010110110	0101000110
D27.1	11011100	1101101001	0010011001	D31.1	11111100	1010111001	*0101001001*
D27.5	11011101	1101101010	0010011010	D31.5	11111101	1010111010	*0101001010*
D27.3	11011110	1101100011	0010011100	D31.3	11111110	1010110011	0101001100
D27.7	11011111	1101100001	0010011110	D31.7	11111111	1010110001	0101001110

FIG. 12

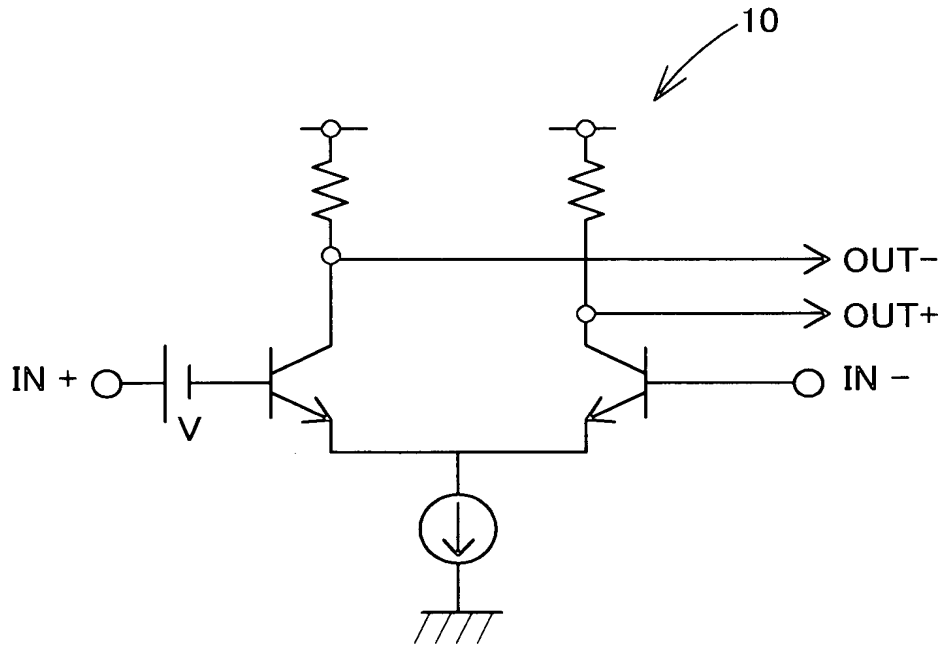SPECIFIC EXAMPLE VOLTAGE LEVEL DETECTOR IN THIRD
EMBODIMENT

FIG. 13

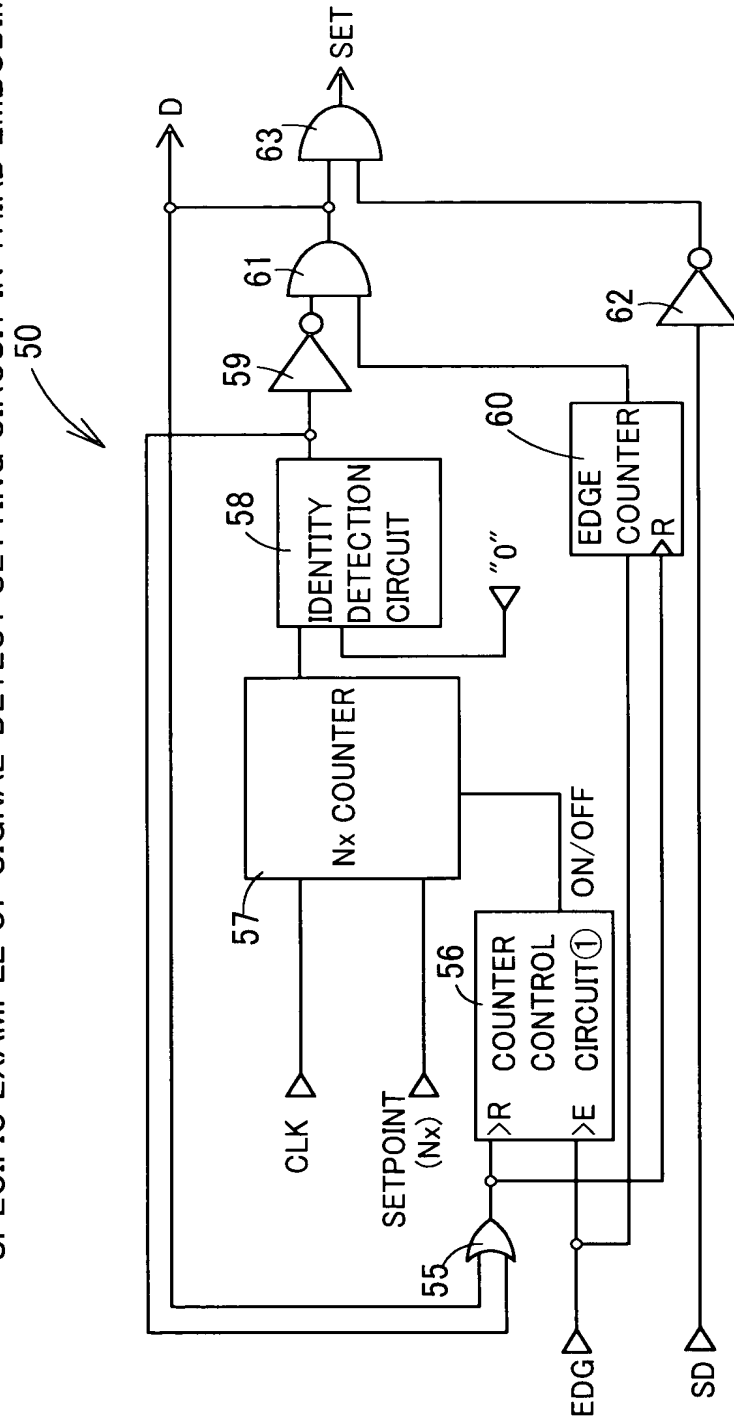SPECIFIC EXAMPLE OF SIGNAL-DETECT SETTING CIRCUIT IN THIRD EMBODIMENT

FIG. 14

SPECIFIC EXAMPLE OF SIGNAL-DETECT RESETTING CIRCUIT IN THIRD
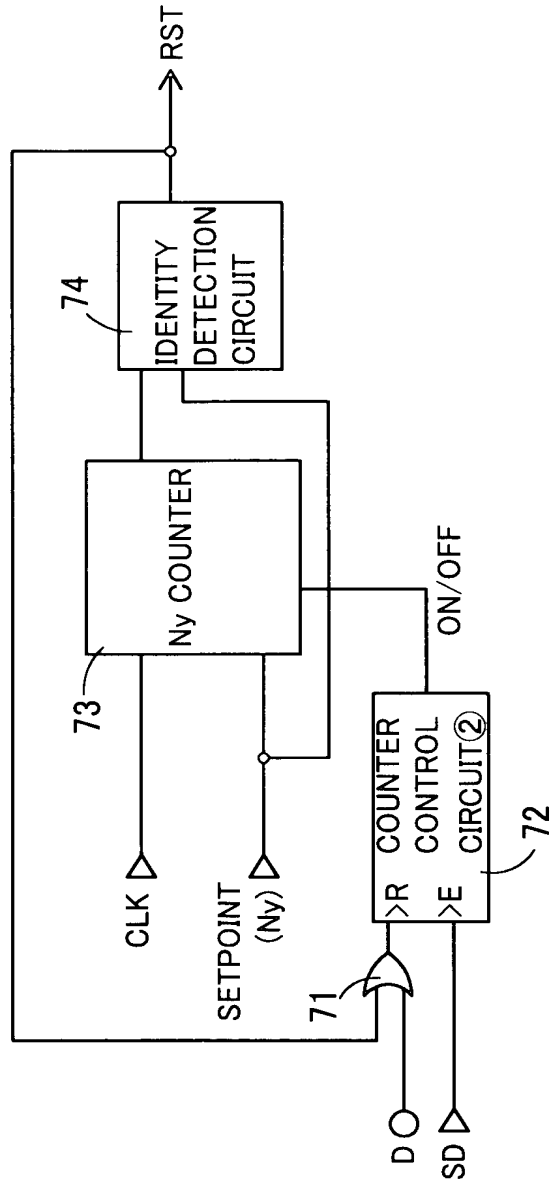EMBODIMENT

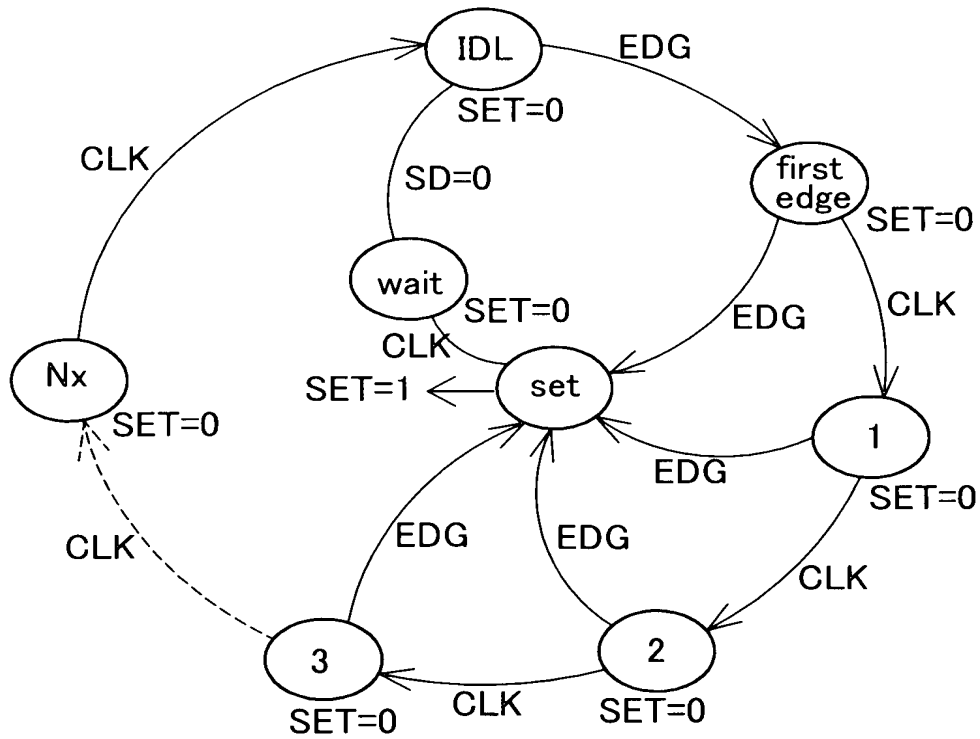# FIG. 15 SIGNAL-DETECT SIGNAL SETTING SEQUENCE

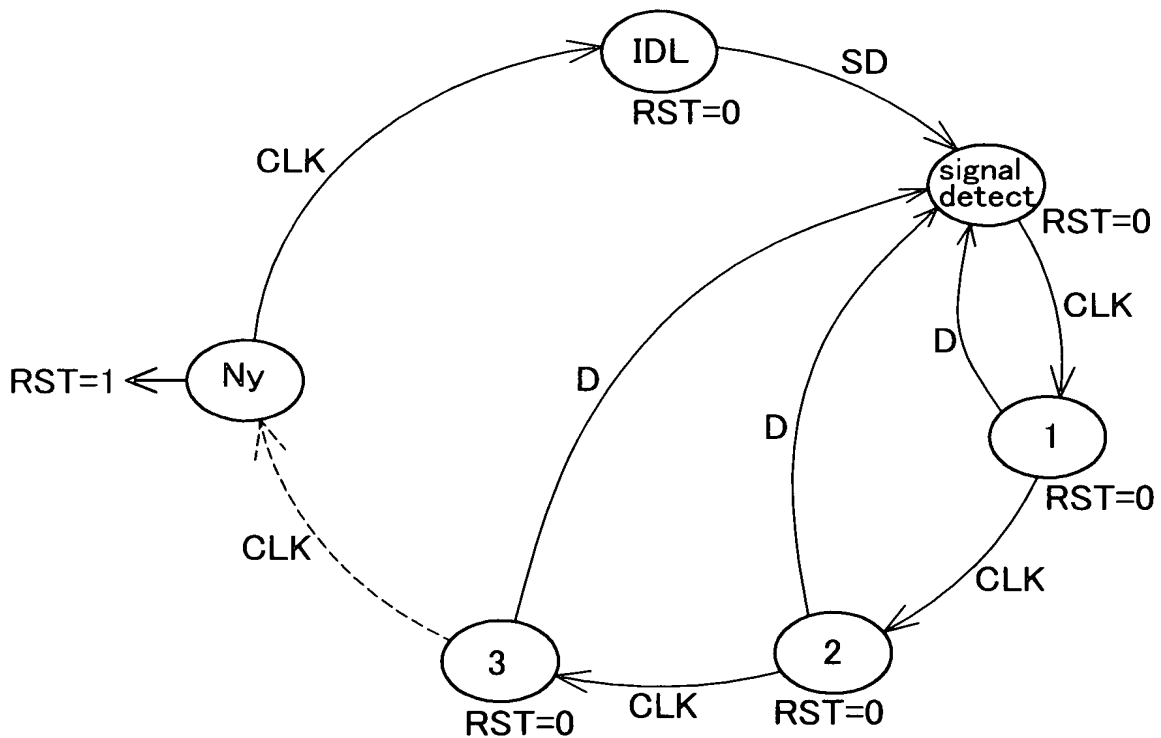# FIG. 16 SIGNAL-DETECT SIGNAL RESETTING SEQUENCE

FIG. 17

TIME CHART SHOWING SIGNAL-DETECT SIGNAL SETTING SEQUENCE

14

INPUT SIGNALS
(IN+/IN−)

(DIFFERENTIAL)

PRESCRIBED VALUE

OUTPUT
OF VOLTAGE
LEVEL
DETECTOR
(L)

(HIGH LEVEL: OUTPUT
EXCEEDING
PRESCRIBED
VALUE)

(1) (2) (3)

SIGNAL-
DETECT
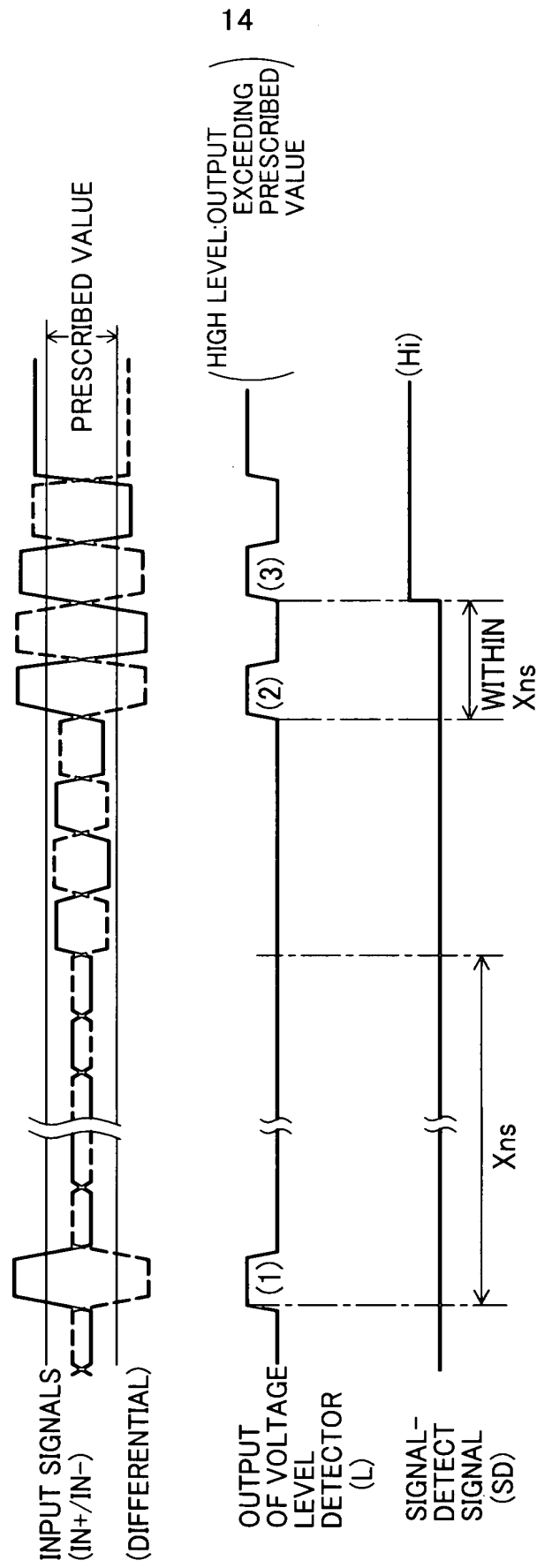SIGNAL
(SD)

(Hi)

Xns

WITHIN
Xns

15

FIG. 18

TIME CHART SHOWING ACTIONS DURING SIGNAL-DETECT SIGNAL SETTING
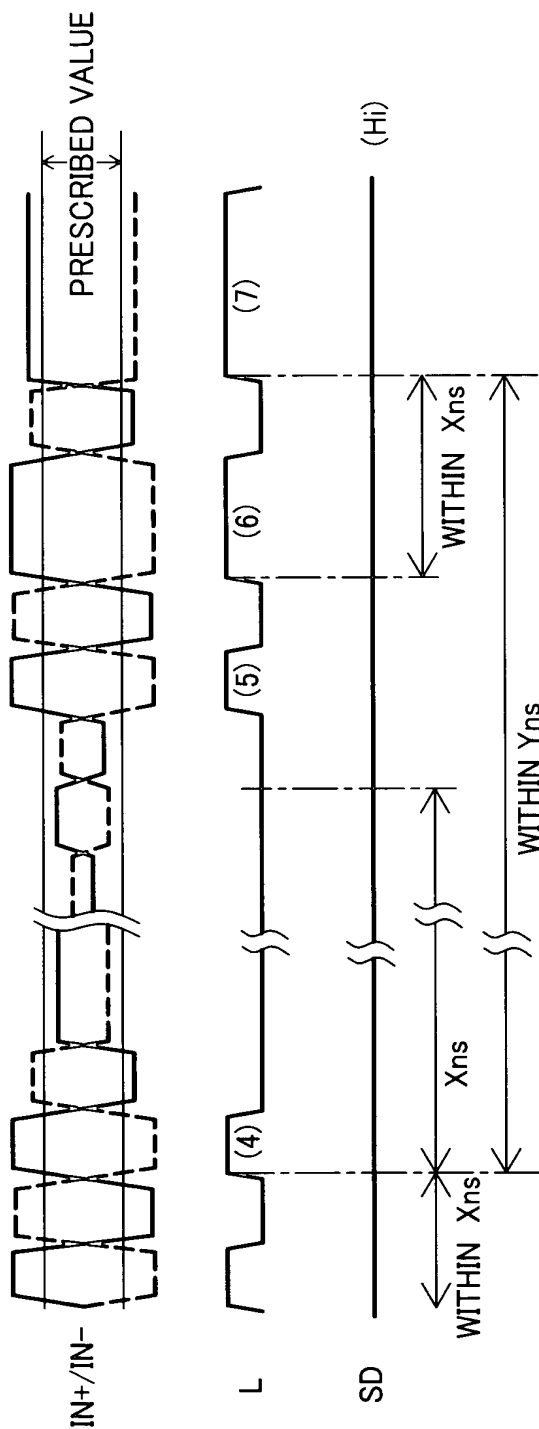
FIG. 19

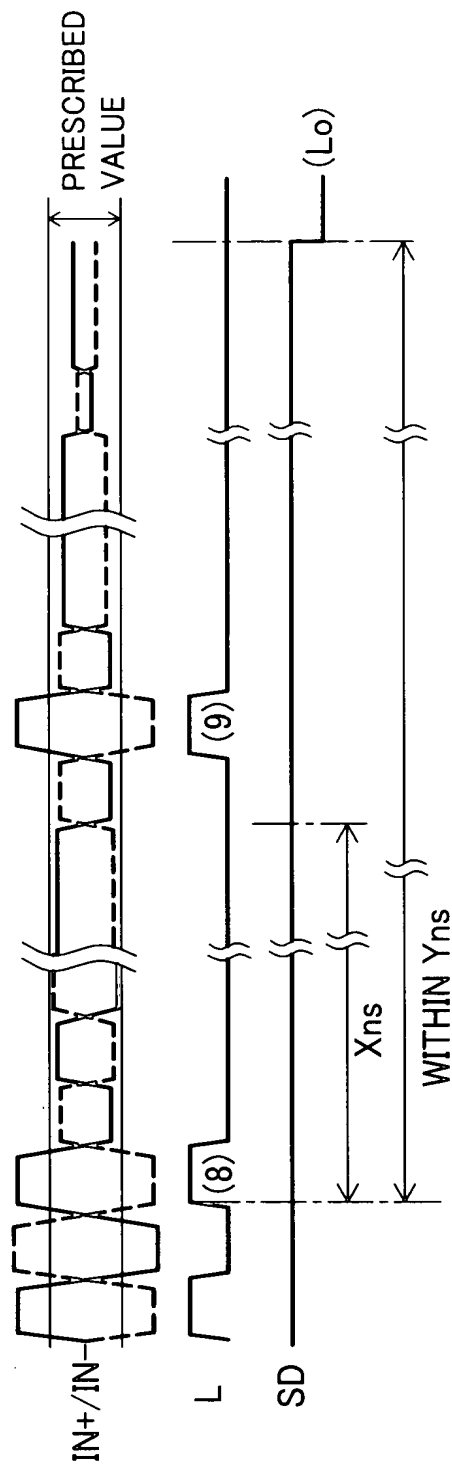TIME CHART SHOWING SIGNAL-DETECT SIGNAL RESETTING SEQUENCE

FIG. 20

CONFIGURATIONAL DIAGRAM OF SIGNAL DETECTION APPARATUS
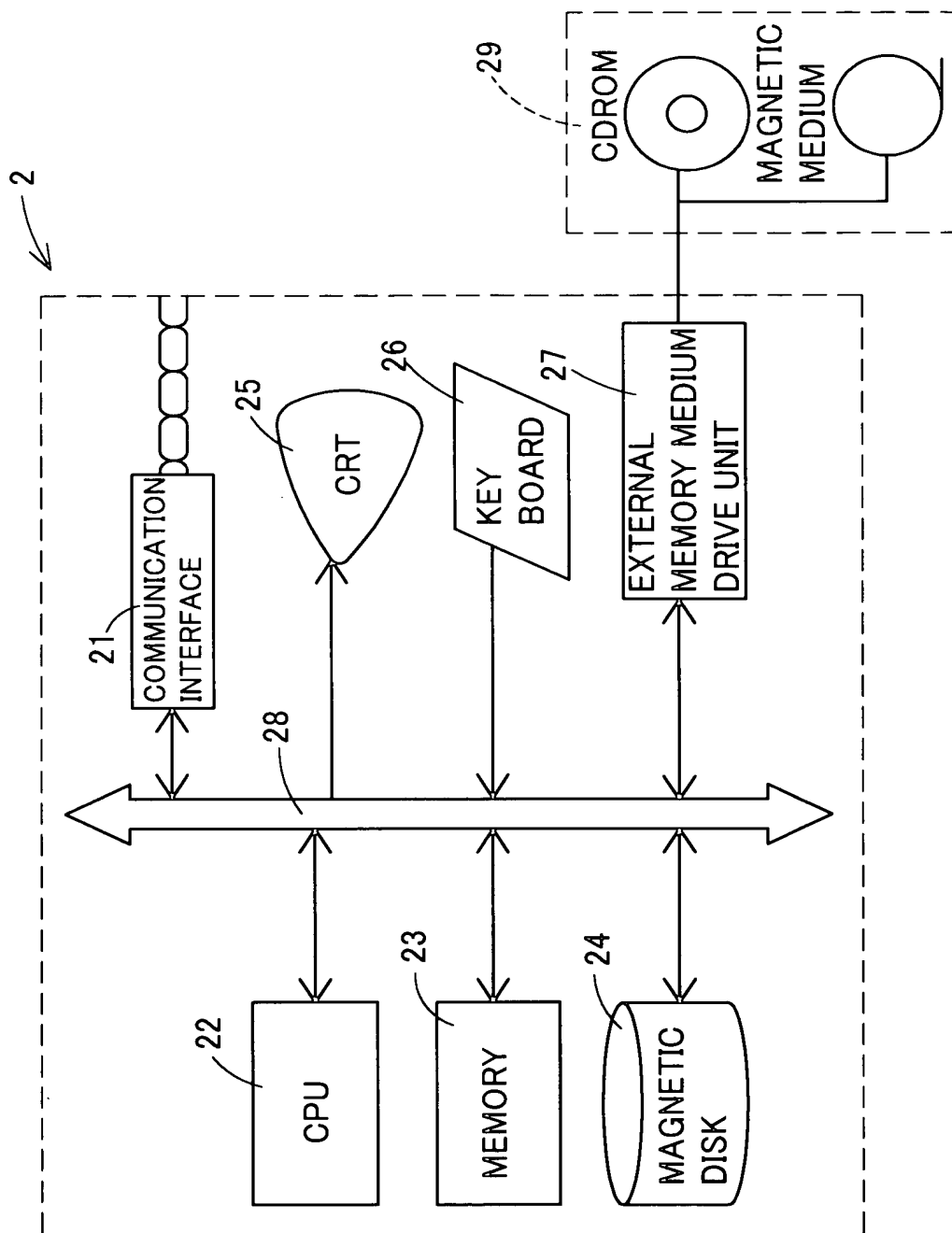IN FOURTH EMBODIMENT

FIG. 21 SIGNAL DETECTION METHOD EXECUTED BY SIGNAL
DETECTION APPARATUS IN FOURTH EMBODIMENT
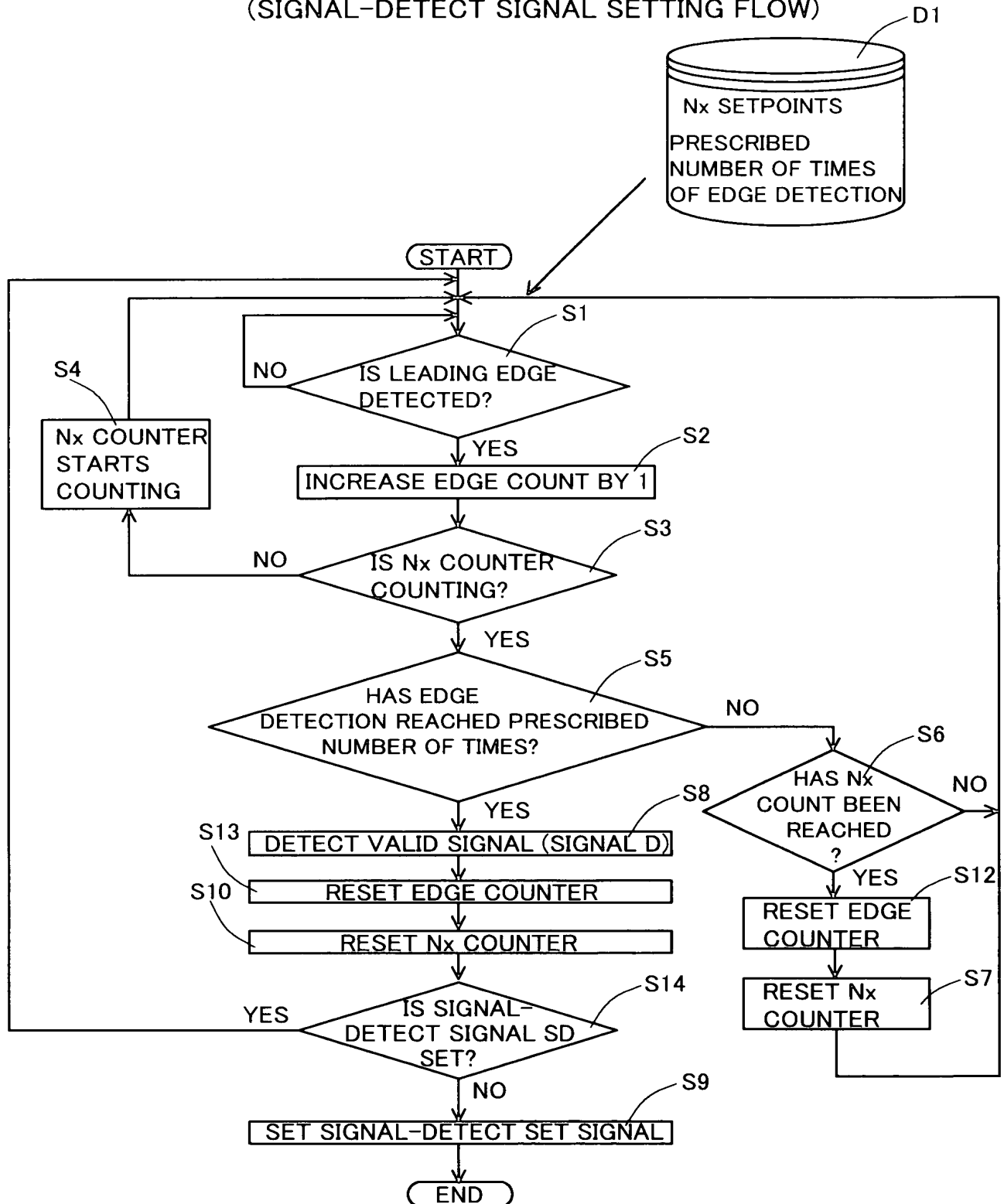(SIGNAL-DETECT SIGNAL SETTING FLOW)

D1

Nx SETPOINTS
PRESCRIBED
NUMBER OF TIMES
OF EDGE DETECTION

START

S1 — IS LEADING EDGE DETECTED? — NO

S4 — Nx COUNTER STARTS COUNTING

YES

S2 — INCREASE EDGE COUNT BY 1

S3 — IS Nx COUNTER COUNTING? — NO

YES

S5 — HAS EDGE DETECTION REACHED PRESCRIBED NUMBER OF TIMES? — NO

S6 — HAS Nx COUNT BEEN REACHED? — NO

YES

S8 — S13 — DETECT VALID SIGNAL (SIGNAL D)

S10 — RESET EDGE COUNTER

RESET Nx COUNTER

YES

S12 — RESET EDGE COUNTER

S7 — RESET Nx COUNTER

S14 — IS SIGNAL-DETECT SIGNAL SD SET? — YES

NO

S9 — SET SIGNAL-DETECT SET SIGNAL

END

FIG. 22 SIGNAL DETECTION METHOD EXECUTED BY SIGNAL DETECTION APPARATUS IN FOURTH EMBODIMENT (SIGNAL-DETECT SIGNAL RESETTING FLOW)

D2

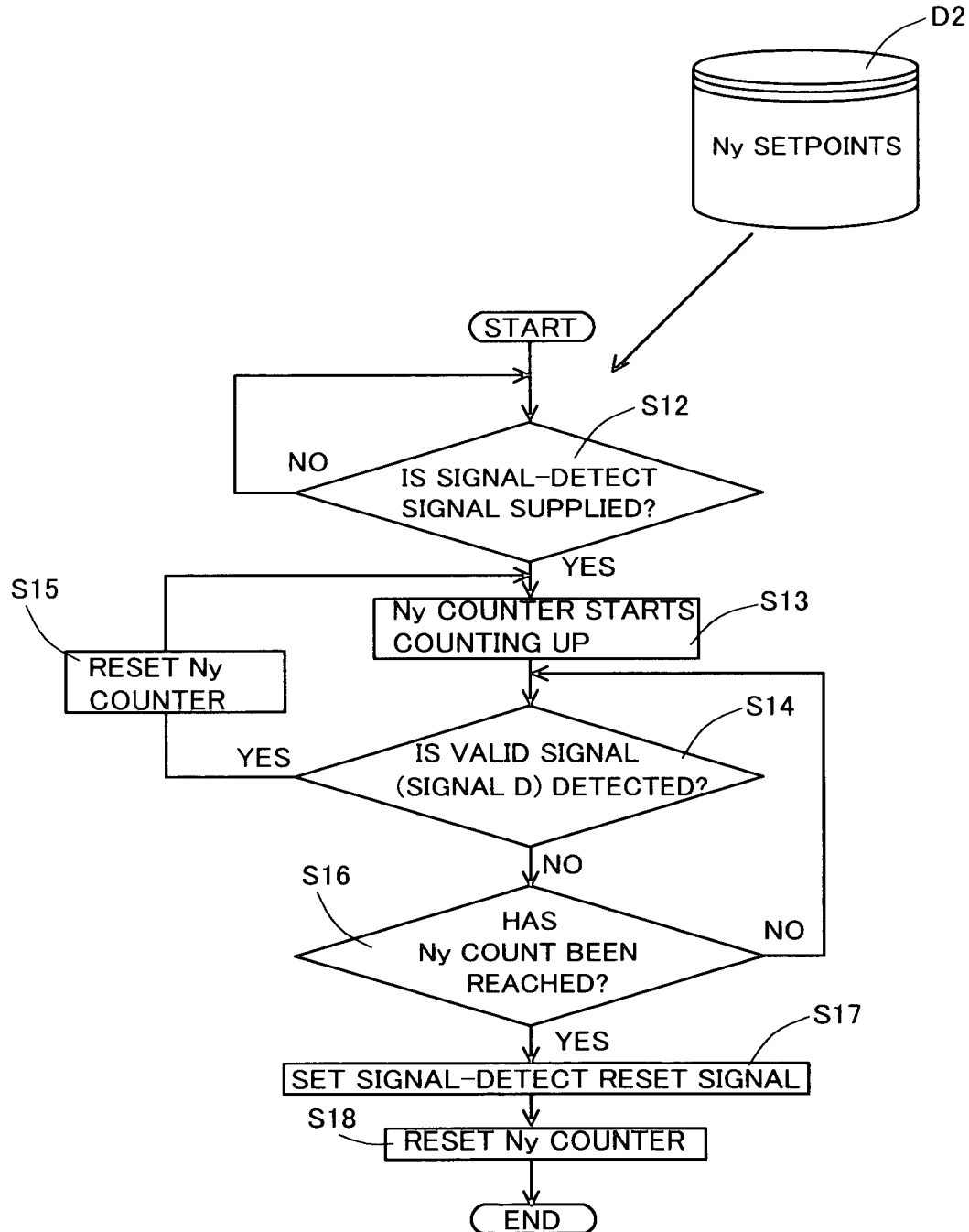Ny SETPOINTS

START

S12

IS SIGNAL-DETECT SIGNAL SUPPLIED? — NO

YES

Ny COUNTER STARTS COUNTING UP — S13

S15

RESET Ny COUNTER

S14

YES — IS VALID SIGNAL (SIGNAL D) DETECTED?

NO

S16

HAS Ny COUNT BEEN REACHED? — NO

YES

SET SIGNAL-DETECT RESET SIGNAL — S17

S18 — RESET Ny COUNTER

END

FIG. 23

EXAMPLE OF DIFFERENTIAL SIGNAL TRANSMISSION SYSTEM

1 OR 2A THROUGH 2D

TP

OUT

OUTX

0.4 μF

0.4 μF

55 Ω   55 Ω

1M   270PF
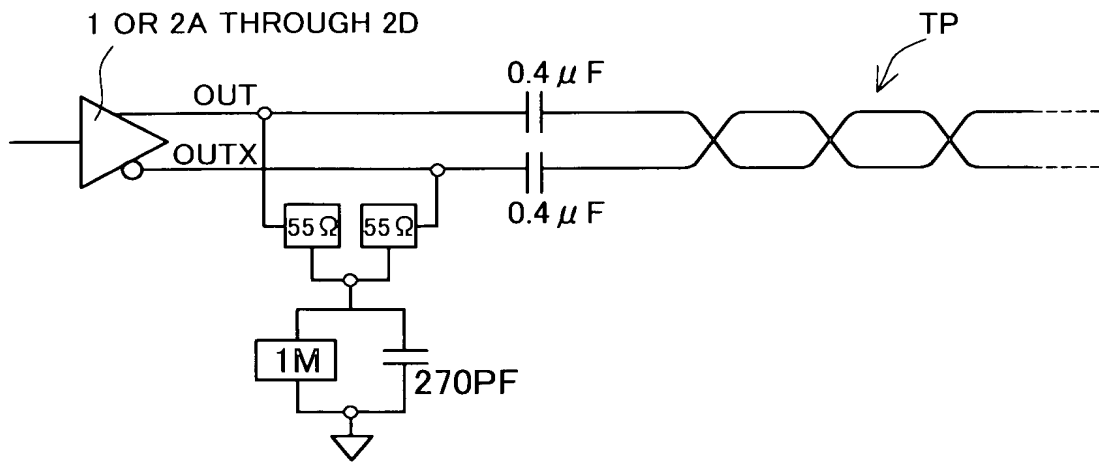
FIG. 24

EXAMPLE OF SIGNAL TRANSMISSION SYSTEM CONFIGULATION

ID=0
APPARATUS
A

BB

ID=4
APPARATUS
B

ID=1
APPARATUS
C

ID=7
APPARATUS
F

ID=6
APPARATUS
G

ID=5
APPARATUS
H

ID=3
APPARATUS
D

ID=2
APPARATUS
E

ID=8....n
OTHER
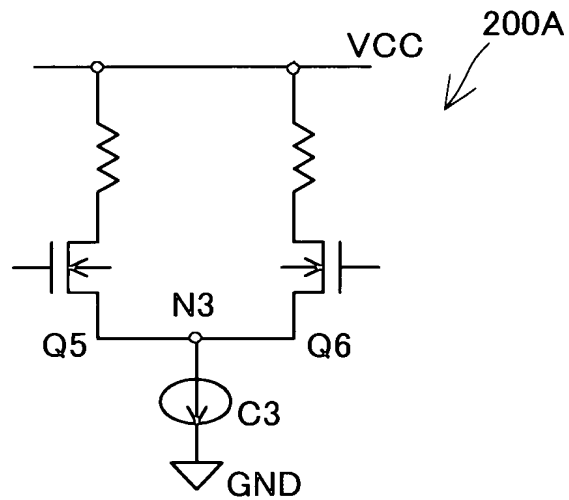APPARATUSES
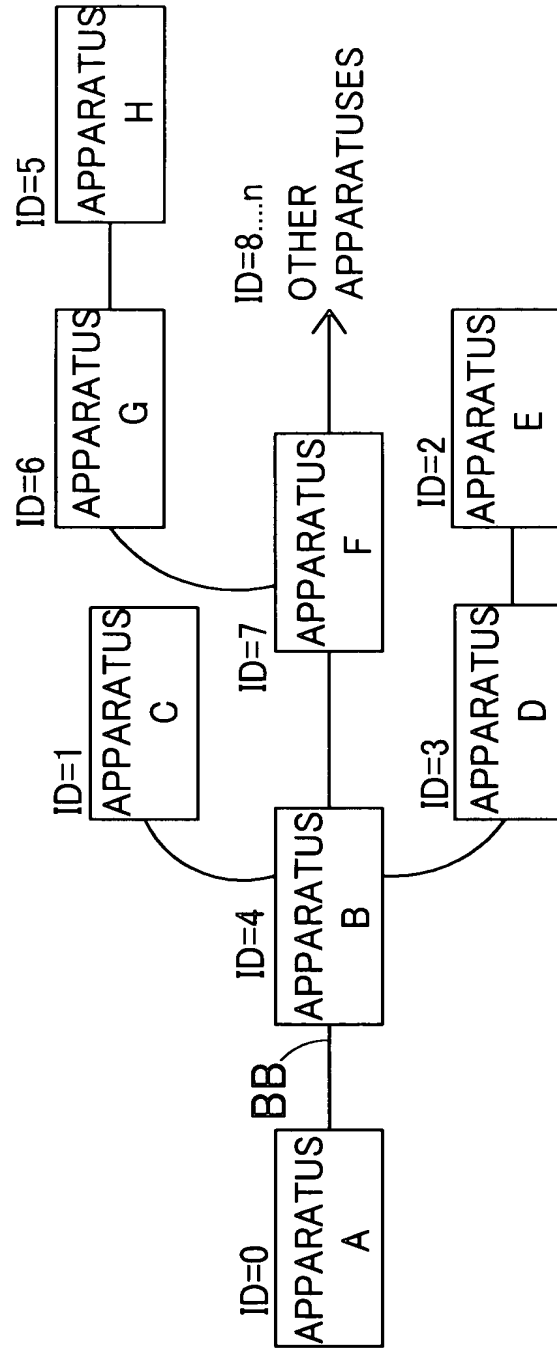
FIG. 25 PRIOR ART

DIFFERENTIAL SIGNAL OUTPUT CIRCUIT ACCORDING
TO PRIOR ART
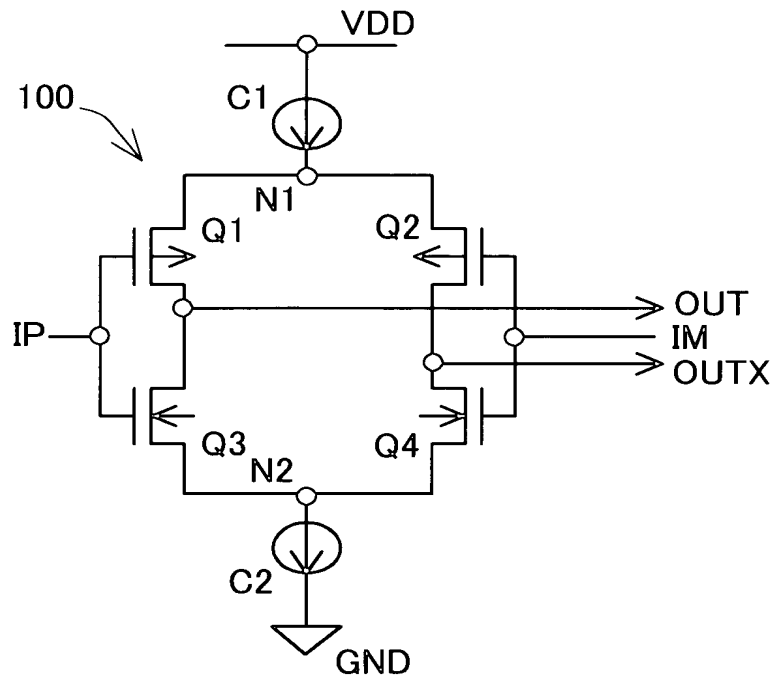
FIG. 26A   PRIOR ART

ANOTHER DIFFERENTIAL SIGNAL OUTPUT CIRCUIT ACCORDING
TO PRIOR ART

CIRCUIT WITH PASSIVE LOADS
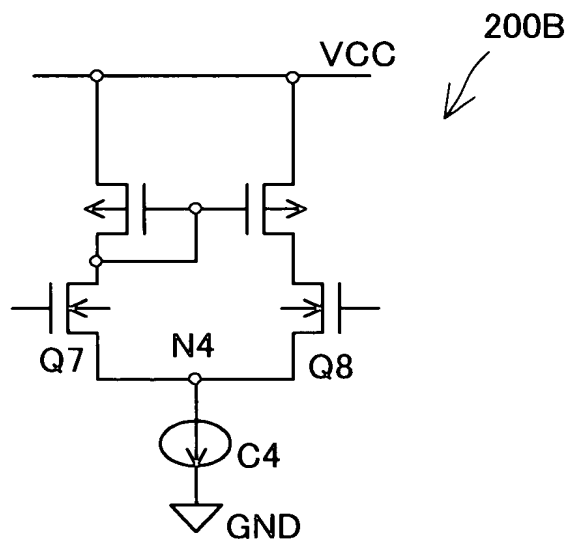

FIG. 26B

CIRCUIT WITH ACTIVE LOADS

FIG. 27   PRIOR ART

SIGNAL DETECTION APPARATUS ACCORDING TO PRIOR ART